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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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STEPHEN A GRATTON
2764 SOUTH BRAUN WAY
LAKEWOOD, CO 80228

EXAMINER

PAREKH, NITIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 06/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/258,961

Applicant(s)

Jiang et al

Examiner

Nitin Parekh

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Mar 25, 2002
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 24-36 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 24-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 2 and 6 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 24-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) in view of Lee et al (US Pat. 5796586), Akram et al (US Pat. 5739585) and Hoffman et al (US Pat. 5360942).

Regarding claims 24-26, the admitted prior art (Fig.1A and B; pages 2-4) et al discloses a semiconductor package comprising :

- a substrate comprising a first surface, a second surface, a plurality of conductors and ball bonding pads formed on the first surface and a bonding opening from the first surface to the second surface
- a semiconductor die having a first outline and a face being aligned with the bonding opening and attached/bonded to the second surface on a die attach area
- first mask on the first surface of the substrate comprising a plurality of via openings aligned with the ball bonding pads, the mask partially covering the conductors

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- a second mask substantially covering a second surface of the substrate
- an adhesive layer between the die and the substrate in the die attach area to bond the face to the second mask and the substrate,
- a plurality of wires placed through the bonding opening and wire bonded to the die and to the conductors
- an encapsulating material/resin on the die and the second mask, and
- a conventional glob top/polymer in the bonding opening encapsulating the wires.

The admitted prior art (APA) fails to specify:

- a) directly bonding the die to the second surface and having an opening in the second mask including a second outline corresponding to but only slightly larger than the first outline, and
- b) the adhesive layer comprising a filled adhesive/epoxy configured to transfer heat from the face to the second surface.

a) Lee et al disclose that it is conventional that a die attach area is not covered with solder mask so that the die attaches directly to the substrate surface (Col. 8, line 7).

Lee et al teach using a second mask having an opening through the mask with a second outline (see hatched mask area 218' with a second outline- Fig. 7; Col. 7, line 55) substantially matching that of the first outline with an open die attach area (see first

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outline area 204- Fig. 7) on the second surface so that the die is directly bonded to the second surface so that the solder mask can provide a better resistance against cracking at the substrate surface (Fig. 7 and Fig. 1-6; Col. 1-8).

Lee et al further teach using solder mask patterns where the second outline is larger than the die attach region (Fig. 1A and B).

b) Akram et al teach using conventional die attach technique where the die (18 in Fig. 10; Col. 9, line 24) is face-bonded to the second surface using typical adhesive/fill materials (Col. 4, line 26) such as an epoxy, silicone, polyimide, other dielectric material, etc. The cited reference by Shim et al teach using a conventional heat conductive epoxy (3 in Fig. 4) to provide the desired adhesion and heat dissipation.

Hoffman et al teach using conventional die attach/adhesive material comprising a filled epoxy (40 in Fig. 3) configured to provide improved heat transfer and/or electrical conductivity (Col. 3, line 60- Col. 4, line 2).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to use a second mask having an opening and a second outline corresponding to but only slightly larger than the first outline so that the die is bonded directly to the second surface using a filled adhesive so that the bonding and heat transfer from the chip to the substrate can be improved and the cracking of the

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solder mask can be prevented using Lee et al, Akram et al and Hoffman's bonding structure in the admitted prior art.

Regarding claim 27, as explained above for claim 24, the APA further discloses the first mask having a first opening exposing the wire bonding pads (Fig. 1A).

Claim 28 has an identical scope as claims 27 and 24, as explained in the above rejections.

Regarding claim 29, as explained above for claim 24, the APA further discloses the first and second solder masks comprising a conventional photoimageable material (Specification pp. 2-4).

Claims 30-33 have an identical scope as claims 24 and 27, as explained in the above rejections.

Claims 34-36 have an identical scope as claims 24 and 27, as explained in the above rejections.

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Response to Arguments

3. Applicant's arguments with respect to claims 24-36 have been considered but are moot in view of the new ground(s) of rejection.

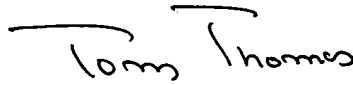
Papers related to this application may be submitted directly to Art Unit 2811 by facsimile transmission. Papers should be faxed to Art Unit via Technology Center 2800 fax center located in Crystal Plaza 4, room 4C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number in (703) 305-3410. The examiner can be normally reached on Monday-Friday from 08:30 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas, can be reached on (703) 308-2772. The fax number for the organization where this application or proceeding is assigned is (703) 308-7722 or 7724.

Nitin Parekh

06-07-02


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800